

What is claimed is:

1. A composition comprising an UV stabilizing composition comprising:

- 5 (i) an ortho-hydroxy tris-aryl-s-triazine compound;  
(ii) a hindered amine compound; and  
(iii) a hydroxybenzophenone compound.

2. A composition comprising an UV stabilizing composition comprising:

- 10 (i) an ortho-hydroxy tris-aryl-s-triazine compound;  
(ii) a hindered amine compound; and  
(iii) a hydroxybenzophenone compound

where the ratio of the hindered amine compound to the triazine compound is about 3:1 to about 25:1; and the ratio of the hindered amine compound to the hydroxybenzophenone compound is about 1:1 to 25:1

15 3. The composition of claim 2 further comprising a material to be stabilized.

4. The composition of claim 3 wherein the amount of the triazine compound is about 20 ppm to about 2000 ppm, the amount of the hydroxybenzophenone is about 20 ppm to about 5000 ppm and the amount of the hindered amine is about 250 ppm to about 20000 ppm, all based on the weight of the material to be stabilized.

5. The composition of claim 3, wherein said material to be stabilized is selected from the group consisting of: polyolefins, polyesters, polyethers, polyketones,

25 polyamides, natural and synthetic rubbers, polyurethanes, polystyrenes, high-impact polystyrenes, polyacrylates, polymethacrylates, polyacetals, polyacrylonitriles,

polybutadienes, polystyrenes, acrylonitrile-butadiene-styrene, styrene acrylonitrile, acrylate styrene acrylonitrile, cellulosic acetate butyrate, cellulosic polymers, polyimides, polyamideimides, polyetherimides, polyphenylsulfides, polyphenyloxide, polysulfones,

30 polyethersulfones, polyvinylchlorides, polycarbonates, polyketones, aliphatic polyketones, thermoplastic olefins, aminoresin cross-linked polyacrylates and polyesters, polyisocyanate cross-linked polyesters and polyacrylates, phenol/formaldehyde, urea/formaldehyde and melamine/formaldehyde resins, drying and non-drying alkyd resins, alkyd resins, polyester resins, acrylate resins cross-linked with melamine resins,

35 urea resins, isocyanates, isocyanurates, carbamates, and epoxy resins, cross-linked epoxy resins derived from aliphatic, cycloaliphatic, heterocyclic and aromatic glycidyl

compounds, which are cross-linked with anhydrides or amines, polysiloxanes, Michael addition polymers, amines, blocked amines with activated unsaturated and methylene compounds, ketimines with activated unsaturated and methylene compounds, polyketimines in combination with unsaturated acrylic polyacetoacetate resins, polyketimines in combination with unsaturated acrylic resins, radiation curable compositions, epoxymelamine resins, organic dyes, cosmetic products, cellulose-based paper formulations, photographic film paper, fibers, waxes, inks, and blends thereof.

6. The composition of claim 2, wherein said triazine is selected from the group consisting of: 2,4,6-tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-triazine; 2-(2-hydroxy-4-n-octyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine; 2-(2-hydroxy-4-(mixed iso-octyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine; 2-(2,4-dihydroxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine; 2,4-bis(2-hydroxy-4-propyloxyphenyl)-6-(2,4-dimethylphenyl)-1,3,5-triazine; 2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(4-methylphenyl)-1,3,5-triazine; 2-(2-hydroxy-4-dodecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine; 2-(2-hydroxy-4-tridecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine; 2-[2-hydroxy-4-(2-hydroxy-3-butyloxypropyloxy)phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine; 2-[2-hydroxy-4-(2-hydroxy-3-octyloxypropyloxy)-phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine; 2-[4-dodecyloxy/tridecyloxy-2-hydroxypropoxy)-2-hydroxyphenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine; 2-[2-hydroxy-4-(2-hydroxy-3-dodecyloxypropoxy)phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine; 2-(2-hydroxy-4-hexyloxy)phenyl-4,6-diphenyl-1,3,5-triazine; 2-(2-hydroxy-4-methoxyphenyl)-4,6-diphenyl-1,3,5-triazine; 2,4,6-tris[2-hydroxy-4-(3-butoxy-2-hydroxypropoxy)phenyl]-1,3,5-triazine; 2-(2-hydroxyphenyl)-4-(4-methoxyphenyl)-6-phenyl-1,3,5-triazine and mixtures thereof.

7. The composition of claim 2, wherein said hindered amine compound is selected from the group consisting of: 1H-Pyrrole-2,5-dione, 1-octadecyl-, polymer with (1-methylethenyl)benzene and 1-(2,2,6,6-tetramethyl-4-piperidiny)-1H-pyrrole-2,5-dione; piperazinone, 1,1',1''-[1,3,5-triazine-2,4,6-triyltris[(cyclohexylimino)-2,1-ethanediyl]]tris[3,3,5,5-tetramethyl-]; piperazinone, 1,1',1''-[1,3,5-triazine-2,4,6-triyltris[(cyclohexylimino)-2,1-ethanediyl]]tris[3,3,4,5,5-pentamethyl-]; the reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane and epichlorohydrin; the condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine; the condensate of 1,2-bis(3-aminopropylamino)ethane, 2,4,6-trichloro-1,3,5-triazine and 4-butylamino-2,2,6,6-tetramethylpiperidine; the condensate of N,N'-bis(2,2,6,6-

tetramethylpiperidin-4-yl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine; the condensate of 2-chloro-4,6-bis(4-n-butylamino-2,2,6,6-tetramethylpiperidyl)-1,3,5-triazine and 1,2-bis(3-aminopropylamino)ethane; the condensate of 2-chloro-4,6-bis(4-n-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazine and 1,2-bis-(3-aminopropylamino)ethane; 2-[(2-hydroxyethyl)amino]-4,6-bis[N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidin-4-yl)butylamino-1,3,5-triazine; propanediolc acid, [(4-methoxyphenyl)methylene]-bis-(1,2,2,6,6-pentamethyl-4-piperidinyl) ester; tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, 1-[2-[3-[3,5-bis(1,1-dimethylethyl)-4-hydroxyphenyl]-1-oxopropoxy]ethyl]-2,2,6,6-tetramethyl-4-piperidinyl ester; N-(1-octyloxy-2,2,6,6-tetramethylpiperidin-4-yl)-N'-dodecyloxalamide; tris(2,2,6,6-tetramethylpiperidin-4-yl)nitritriacetate; 1,5-dioxaspiro{5,5}undecane-3,3-dicarboxylic acid, bis(1,2,2,6,6-pentamethyl-4-piperidinyl); 1,5-dioxaspiro{5,5}undecane-3,3-dicarboxylic acid, bis(2,2,6,6-tetramethyl-4-piperidinyl); the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid; the condensate of N,N'-bis(2,2,6,6-tetramethylpiperidin-4-yl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine; 1,2,3,4-butanetetracarboxylic acid, 1,2,2,6,6-pentamethyl-4-piperidinyl tridecyl ester; tetrakis(2,2,6,6-tetramethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; 1,2,3,4-butanetetracarboxylic acid, 2,2,6,6-tetramethyl-4-piperidinyl tridecyl ester; tetrakis(1,2,2,6,6-pentamethylpiperidin-4-yl)-1,2,3,4-butanetetracarboxylate; mixture of 2,2,4,4-tetramethyl-21-oxo-7-oxa-3,20-diazaspiro(5.1.11.2)-heneicosane-20-propanoic acid-dodecylester; 2,2,4,4-tetramethyl-21-oxo-7-oxa-3,20-diazaspiro(5.1.11.2)-heneicosane-20-propanoic acid-tetradecylester; 1H,4H,5H,8H-2,3a,4a,6,7a,8a-hexaazacyclopenta[def]fluorene-4,8-dione, hexahydro-2,6-bis(2,2,6,6-tetramethyl-4-piperidinyl)-; polymethyl[propyl-3-oxy(2',2',6',6'-tetramethyl-4,4'-piperidinyl)]siloxane; polymethyl[propyl-3-oxy(1',2',2',6',6'-pentamethyl-4,4'-piperidinyl)]siloxane; copolymer of methylmethacrylate with ethyl acrylate and 2,2,6,6-tetramethylpiperidin-4-yl acrylate; copolymer of mixed C<sub>20</sub> to C<sub>24</sub> alpha-olefins and (2,2,6,6-tetramethylpiperidin-4-yl)succinimide; 1,2,3,4-butanetetracarboxylic acid, polymer with β,β,β',β'-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]undecane-3,9-diethanol, 1,2,2,6,6-pentamethyl-4-piperidinyl ester; 1,2,3,4-butanetetracarboxylic acid, polymer with β,β,β',β'-tetramethyl-2,4,8,10-tetraoxaspiro[5.5]undecane-3,9-diethanol, 2,2,6,6-tetramethyl-4-piperidinyl ester copolymer; 1,3-benzenedicarboxamide, N,N'-bis(2,2,6,6-tetramethyl-4-piperidinyl); 1,1'-(1,10-dioxo-1,10-decanediyl)-bis(hexahydro-2,2,4,4,6-pentamethylpyrimidine; ethane diamide, N-(1-acetyl-2,2,6,6-tetramethylpiperidinyl)-N'-dodecyl; formamide, N,N'-1,6-hexanediybis[N-(2,2,6,6-tetramethyl-4-piperidinyl)]; D-glucitol, 1,3:2,4-bis-O-(2,2,6,6-tetramethyl-4-piperidinylidene)-; 2,2,4,4-tetramethyl-7-oxa-3,20-diaza-

21-oxo-dispiro[5.1.11.2]heneicosane; propanamide, 2-methyl-N-(2,2,6,6-tetramethyl-4-piperidiny)-2-[(2,2,6,6-tetramethyl-4-piperidiny)amino]-; 7-oxa-3,20-diazadispiro[5.1.11.2]heneicosane-20-propanoic acid, 2,2,4,4-tetramethyl-21-oxo-, dodecyl ester; N-(2,2,6,6-tetramethylpiperidin-4-yl)- $\beta$ -aminopropionic acid dodecyl ester; N-(2,2,6,6-tetramethylpiperidin-4-yl)-N'-aminooxalamide; propanamide, N-(2,2,6,6-tetramethyl-4-piperidiny)-3-[(2,2,6,6-tetramethyl-4-piperidiny)amino]-; mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine; 3-dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; 3-dodecyl-1-(1-ethanoyl-2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; bis(2,2,6,6-tetramethylpiperidin-4-yl)succinate; bis(1,2,2,6,6-pentamethylpiperidin-4-yl) n-butyl 3,5-di-tert-butyl-4-hydroxybenzylmalonate; tris(2,2,6,6-tetramethylpiperidin-4-yl) nitrilotriacetate; 1,1'-(1,2-ethanediyl)bis(3,3,5,5-tetramethylpiperazinone); 4-benzoyl-2,2,6,6-tetramethylpiperidine; 4-stearyloxy-2,2,6,6-tetramethylpiperidine; bis(1,2,2,6,6-pentamethylpiperidyl)-2-n-butyl-2-(2-hydroxy-3,5-di-tert-butylbenzyl)malonate; 3-n-octyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decan-2,4-dione; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)sebacate; bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate; 8-acetyl-3-dodecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decane-2,4-dione; 3-dodecyl-1-(2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1-ethanoyl-2,2,6,6-tetramethylpiperidin-4-yl)pyrrolidin-2,5-dione; 3-dodecyl-1-(1,2,2,6,6-pentamethylpiperidin-4-yl)pyrrolidine-2,5-dione; a mixture of 4-hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine; 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxospiro[4.5]decane; 1,5-dioxaspiro[5,5]undecane-3,3-dicarboxylic acid, bis(2,2,6,6-tetramethyl-4-piperidiny) and 1,5-dioxaspiro[5,5]undecane-3,3-dicarboxylic acid, bis(1,2,2,6,6-pentamethyl-4-piperidiny) and mixtures thereof.

8. The composition of claim 2 wherein said hydroxybenzophenone is selected from the group consisting of 2,4-dihydroxybenzophenone, 2-hydroxy-4-methoxybenzophenone, 2-hydroxy-4-octyloxybenzophenone, 2-hydroxy-4-decyloxybenzophenone, 2-hydroxy-4-dodecyloxybenzophenone, 2-hydroxy-4-benzoyloxybenzophenone, 2,2'-dihydroxy-4,4'-dimethoxybenzophenone, 2,2',4,4'-tetrahydroxybenzophenone, 2,4-dihydroxy-4'-tert-butylbenzophenone; 1,6-bis-(3-hydroxy-4-benzoylphenoxy)hexane; methylenebis-(2-benzoyl-5-methoxyphenol) and mixtures thereof.

9. The composition of claim 2, further comprising a benzotriazole compound.

10. A composition comprising an UV stabilizing composition comprising:  
(i) an ortho-hydroxy tris-aryl-s-triazine compound;

- (ii) a hindered amine compound; and
- (iii) a benzotriazole compound

wherein the ratio of the hindered amine compound to the triazine compound is about 3:1 to about 25:1; and the ratio of the hindered amine compound to the benzotriazole compound is about 2:1 to 10:1.

11. The composition of claim 10 further comprising a material to be stabilized.

12. The composition of claim 11 wherein the amount of the triazine compound is about 20 ppm to about 2000 ppm, the amount of the benzotriazole is about 20 ppm to about 5000 ppm and the amount of the hindered amine is about 250 ppm to about 20000 ppm, all based on the weight of the material to be stabilized.

13. The composition of claim 10, wherein the benzotriazole compound is selected from the group consisting of: 2-(2-hydroxy-5-methylphenyl)-benzotriazole, 2-(2-hydroxy-5-tert-butylphenyl)-benzotriazole, 2-(2-hydroxy-3,5-di-tert-butylphenyl)-benzotriazole, 5-chloro-2-(2-hydroxy-3-tert-butyl-5-methylphenyl)-benzotriazole, 5-chloro-2-(2-hydroxy-3,5-di-tert-butyl-5-methylphenyl)-benzotriazole, 2-(2-hydroxy-3-tert-butyl-5-methylphenyl)-benzotriazole, 2-(2-hydroxy-3,5-di-tert-butyl-5-methylphenyl)-benzotriazole, 2-(2-hydroxy-3-sec-butyl-5-tert-butyl)-benzotriazole, 2-(2-hydroxy-4-octyloxy)-benzotriazole, 2-(2-hydroxy-5-tert-octyl)-benzotriazole, 2-[2-hydroxy-3,5-di( $\alpha,\alpha$ -dimethylbenzyl)phenyl]-benzotriazole; 2-(2-hydroxy-3-dodecyl-5-methylphenyl)benzotriazole; 2-[2-hydroxy-3-( $\alpha,\alpha'$ -dimethylbenzyl)-5-(1,1,3,3-tetramethylbutyl)phenyl]benzotriazole; 2,2'-methylenebis[4-(1,1,3,3-tetramethylbutyl)-6-benzotriazol-2-ylphenol]; 2,[2-hydroxy-3-(3,4,5,6-tetrahydrophthalimidomethyl)-5-methylphenyl]benzotriazole; 2-[3-tert-butyl-5-(2-(2-ethylhexyloxycarbonyl)ethyl)-2-hydroxyphenyl]benzotriazole; a mixture of transesterification products of 2-[(3-tert-butyl-5-(2-methoxycarbonyl)ethyl)-2-hydroxyphenyl]benzotriazole with polyethylene glycol of about MW 300; 5-chloro-2-[2-hydroxy-3-tert-butyl-5-(2-octyloxycarbonyl)ethylphenyl]benzotriazole and mixtures thereof.

14. A composition according to claim 2, where the ratio of the hindered amine compound to the triazine compound is about 3:1 to about 25:1; and the ratio of the hindered amine compound to the hydroxybenzophenone compound is about 2:1 to 10:1